To facilitate repetition of the experiments, I give a few details as to the application of the guaiacum test. The tincture is prepared by dissolving the resin in absolute alcohol, to a deep brown solution: fresh tincture should be made from time to time, as it is liable to lose with age its property of turning blue when oxidized, especially if it be exposed to light. When the test is about to be applied, a small quantity of hydrogen peroxide, not enough to cause a permanent precipitate, should be added to some of the guaiacum tincture. A few drops of the mixture are then poured on to some of the liquid to be tested, either in a test-tube or on a piece of white porcelain. Boiling destroys the activity of all vegetable liquids. With regard to testing for 'leptomin' in the tissues, the tissue must first of all be freed from oxydases, as Raciborski points out, either by heating to 60° C., or by keeping it for a time in absolute alcohol: but the stay in alcohol must not be too long, otherwise the property of decomposing hydrogen peroxide will also be destroyed. The tissue is then to be treated with the mixture of guaiacum tincture and hydrogen peroxide, when a blue colour will appear in the tissues containing 'leptomin.'

I may add, in conclusion, a few further observations of my own as to the distribution of 'leptomin,' or bodies of that class, in plants. I find that pine-apple juice gives a strong reaction, whilst the juice of oranges, lemons, and apples gives no reaction: the pulp of the apple, and still more its rind, gives a slight reaction. Non-drying oils, such as olive, almond, colza, and rape, give the reaction, but not the drying oils, such as linseed, walnut, and poppy. The behaviour of different kinds of wheat-meal is striking: bran gives a good reaction when a little is sprinkled on a few drops of the mixture of guaiacum and hydrogen peroxide; 'toppings' and 'middlings' give a strong reaction, whereas the pure flour gives little or no reaction.

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ON THE ANATOMY OF THE STEM OF DALBERGIA PANICULATA, ROXB.—For some time it has been known that the stem of *Dalbergia paniculata*, Roxb. exhibits certain anomalies as to its structure. Brandis¹ writes thus concerning this plant:—'A

¹ Brandis, Sir Dietrich, The Forest Flora of North-west and Central India: London, 1874, p. 151. See also Gamble, J. S., A Manual of Indian Timbers: Calcutta, 1881.

moderate-sized or large tree (60 ft. high in the Satpuras). Trunk erect, irregularly scooped out, fluted and compressed, attaining 5-6 ft. girth. Bark smooth, greenish white, no heart-wood. Structure most remarkable, entirely different from that of other *Dalbergias*. Broad concentric masses of wood alternate with narrow soft layers of a fibrous substance, so that planks cut off old trees often fall to pieces.

'South and Central India. Gonda forests in Oudh. Silwalik tract west to the Jumna, ascending to 2,500 ft.'

As far as has been ascertained, no detailed observations have been carried out regarding the anomaly; and this being so, the writer was asked by Sir Dietrich Brandis to investigate the anatomy of the stem. The only material available for this was a dried portion of the trunk from a fair-sized tree. This piece measured 3 cm. in the radial direction, including the cortex, and exhibited two separate arcs of the anomalous structure, with a part of a third. The thicker of these two phloem-zones measured 1-2 mm. across, and the thinner .5-1 mm.

Inasmuch as the *raison d'être* of this note lies in the anomalous structure of the stem, it will be well to describe the anatomy of the narrow zones first. These rings, as has already been mentioned above, alternate with broad yellowish masses of xylem. By the examination of a transverse section, it may at once be seen that the narrow abnormal zones are of the nature of phloem, which is accompanied by a certain amount of cambium. This cambium is situated on the side nearer the centre of the stem, and abuts directly on the xylem-elements. Judging from the crushed appearance of the softer tissue nearer the periphery of the bast-rings, growth goes on to a fairly great extent, new elements being added by the activity of the cambium to the wood on the one side and the phloem on the other; thus a well-marked radial arrangement between these three tissues is seen.

Immediately succeeding the cambium, sieve-tubes and phloem-parenchyma occur, and in the more peripheral regions a large amount of sclerenchyma is produced. The sieve-tubes are extremely well shown, having sieve-plates which, in the material examined, are much obliterated by callus. Obliteration was only observed in those elements nearer the cambium, the sieve-tubes in the more external regions of the zones not showing callus: hence they are somewhat difficult to make out. The diameter of the sieve-plates is, on the average, about .03 mm., it is thus seen that they are of more than

average size. In longitudinal sections it may be observed that sieve-areas are quite numerous on the vertical walls of the tubes; these areas are especially well seen in those elements just external to the cambium, on account of the development of callus.

Sclerenchyma is formed at a short distance from the cambium. The elements of this hard bast are aggregated into masses which are somewhat regularly arranged in concentric rings, each being interrupted by the medullary rays. Alternating with these broken circles of sclerenchyma are soft bast elements which gradually become less in amount as the outer zone of wood is reached, so that in the peripheral parts of the anomalous rings of bast the sclerenchymatous bands may be separated one from the other apparently only by a thickness of one or two parenchyma-cells.

The individual elements of the hard bast do not call for much attention, inasmuch as they present the characters usually associated with such cells. Suffice it to say that they have very hard lignified walls with simple pits and, generally speaking, a very small lumen. For the sake of completeness it will be well to give a short description of the xylem. The wood is made up of the usual elements; that is to say, vessels, fibres, and parenchyma. The vessels vary much in diameter; in transverse section they are generally oval in shape. Very frequently the transverse walls of the original tracheides persist to a greater or less extent, in which case the remnant of the septum is much pitted. Xylem-parenchyma surrounds the vessels. The parenchymatous elements and the fibres are arranged in a somewhat regular manner in alternating zones. The cells constituting both these tissues have fairly thick lignified walls, those of the fibres being thicker than those of the parenchyma, and having simple pits.

The medullary rays are narrow, generally from one to four cells in breadth. They are numerous, and the elements constituting them are simply pitted. From the nature of the material—a dried piece of old stem—it was impossible, unfortunately, to determine the exact mode of origin of the anomaly described above. It appears very probable however that it arises in a manner analogous to that of the phloem-islands in *Strychnos*, for example; that is to say, by the formation of successive cambium-rings. It is hoped to further investigate the origin of the phloem-zones when fresh material is obtained.

It is not proposed to enter into theoretical considerations con-

cerning the facts embodied in this note. It is certainly extremely interesting and equally surprising to find a tree, attaining the height of 60 feet, exhibiting a structure such as is described above. A certain amount of light may be thrown on the subject by the fact that some species of the genus are lianes, and, what is more interesting, that one at least, *D. variabilis*, is a climber when growing in the forest, but a shrub when situated in the open.

Schenck¹ makes a few remarks concerning the anomaly of this plant. He states that within the genus *Dalbergia*, anomalous secondary thickening is only known to him in one species, namely *D. paniculata*. He then goes on to say that 'according to a statement of Brandis (Forest Flora), verified for me by the author, the stem of this species consists of broad concentric masses of wood, which alternate with narrow zones of phloem. This occurrence is the more remarkable, because *D. paniculata* is in no way a liane, but is a tree 60 ft. high. The question as to the origin of the anomalous structure is an open one. The possibility is not excluded, that this species may have been derived from a liane and may have inherited from the latter and retained as a character the special form of secondary thickening. Perhaps one will obtain data for the discussion of this question when the stem-structure and the precise affinities of all the species of *Dalbergia* are known. Gamble mentions besides the anomalous *D. paniculata*, Roxb. a number of East Indian species of *Dalbergia*, mostly trees (*D. Sissoo*, *latifolia*, *cultrata*, *lanceolaria*, *nigrescens*), and two lianes (*D. stipulacea*, *foliacea*), all of which exhibit normal wood.'

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THE OVARY OF PARNASSIA PALUSTRIS, LINN.—The following sentence in Payer's *Traité d'Organogénie comparée de la Fleur* (Paris, 1857), p. 183, first attracted my closer attention to *Parnassia palustris*:—

'Contrairement à ce qui se passe dans la plupart des autres plantes, cette fleur du *Parnassia palustris* commence par être irrégulière dans son développement et finit par être complètement régulière à son état parfait.' After satisfying myself that this was so, I examined a large

¹ Schenck, *Anatomie der Lianen*: Botanische Mittheilungen aus den Tropen, Heft 5, Theil 2, pp. 169-170.

Hill, Thomas George. 1901. "On the anatomy of the stem of *Dalbergia paniculate*, Roxb." *Annals of botany* 15, 183–186.

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